

REMARKS

Claims 1-11, 15 and 16 are pending in the application. Claims 1-11, 15 and 16 are rejected. Claim 1 has been amended for clarity. Support for this amendment is found on p. 2, lines 11-12 of the Specification. Accordingly, no new matter is introduced by these amendments.

Reply to the Rejection of Claims 1-11, 15 and 16 under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 1-11, 15 and 16 as being unpatentable over U.S. Patent No. 6,242,245 to Amann *et al.* ("Amann"). Specifically, the Examiner states –

AMANN et al teaches oxidizing a carbohydrate (paper pulp) with a nitroxyl radical mediator (column 21, lines 62-64 and column 23, line 10 – column 24, line 46). A halide (column 5, line 2) and peroxidase (column 4, line 63 to column 5, line 6)) and adding hydrogen peroxide (column 5, lines 45-51) to the mixture to oxidize the carbohydrate. The claimed nitroxyl radical mediators of AMANN et al do not differ from the mediators of the instant case and/or would have been obvious variants of the nitroxyl radical mediators of AMANN et al (see Applicant's April 19, 2004 amendment, page 9. The claimed conditions are the same and/or obvious over the conditions used in the Examples of AMANN et al.

Applicants strongly disagree. For the following reasons Applicants respectfully traverse the Examiner's rejection of claims 1-11, 15 and 16 as being unpatentable over Amann.

Referring to Amann therein is disclosed a multi-component system for modifying, degrading or bleaching lignin or lignin-containing materials, *i.e.*, a composition and process for delignification. The multi-component system or composition of Amann includes an oxidoreductase, an oxidant suitable for the oxidoreductase, a mediator and at least one enzymatically active additive (col. 2, line 66 - col. 3, line 4). This multi-component system or composition has a high selectivity for lignin (col. 3, lines 22-25).

Preferred enzymes include those of group 1.11, which act on a peroxide as an acceptor and include peroxidase (col. 4, line 63 – col. 5, line 6). The especially preferred enzymes are from group 1.10.3, which have oxygen as the acceptor and includes laccase, the only oxidoreductase exemplified (col. 5, lines 12-19 and 28-31; Examples 1-14). Examples of oxidants include air, oxygen, H₂O₂, organic peroxides, etc. (col. 5, lines 32-59).

Amann provides a broad laundry list of preferred mediators suitable for use in its composition (col. 5, line 60 – col. 24, line 52), which include various nitroxyl radical mediators

(col. 21, line 63 – col. 24, line 46). No nitroxyl radical mediator is used in any of the preferred embodiments illustrated in the Examples. The mediator of Amann cannot inactivate the oxidoreductase and the enzymatically active additive. The enzymatically active additive is selected from the hydrolases group of the enzyme class 3.2.1 (col. 3, lines 4-7; col. 24, line 53 – col. 25, line 12).

Amann's process for delignification of lignin-containing materials involves mixing at least one oxidoreductase, at least one oxidant suitable for the oxidoreductase, and at least one mediator which does not inactivate an enzyme selected from the oxidoreductases and hydrolases group of the enzyme class 3.2.1 together. This mixture is then mixed with least one endohydrolase, either by simultaneous addition of the components to an aqueous suspension of the lignin-containing material, or by adding the mixture and the endohydrolase in any sequence to the suspension (col. 25, lines 13-26).

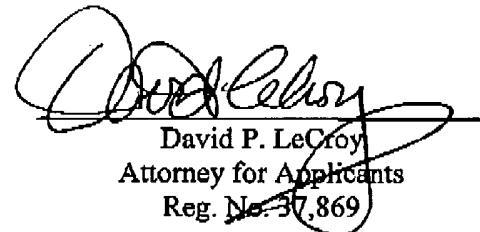
In contrast to the delignification process of Amann, the process according to the present invention is directed towards oxidizing carbohydrates. The process of the present invention involves placing in solution with carbohydrates a nitroxyl radical mediator, a halide and a peroxidase enzyme. A hydroperoxide is also added to the carbohydrate solution. The combination of ingredients enables the oxidation of the carbohydrates. No enzymatic additive is required in the present process.

Further, contrary to the Examiner's assertion, Amann does not teach or suggest the use of a halide. (The Examiner refers to col. 5, line 2 of Amann in support of teaching halides. However, col. 5, line 2 of Amann is only part of a list of suitable oxidoreductases, not halides. Applicants can find no support in Amann for teaching the use of halides in its multi-component system.) As shown in Example 2, Table 2 of the present description, when the halide component is not present, oxidation of the carbohydrate does not occur. As Amann does not include the use of a halide in its delignification process, Amann cannot be said to render obvious the process of the present invention.

Finally, as previously stated, Amann teaches a delignification process. Amann does not teach or suggest that its process would be suitable for oxidizing carbohydrates.

For at least these reasons, claims 1-11, 15 and 16 are not obvious under 35 U.S.C. § 103(a). Withdrawal, therefore, of the rejection of claims 1-11, 15 and 16 over U.S. Patent No. 6,242,245 is respectfully requested.

Respectfully submitted,



David P. LeCroy
Attorney for Applicants
Reg. No. 37,869

Dated: 6 August 2004
NATIONAL STARCH AND CHEMICAL
COMPANY
Post Office Box 6500
Bridgewater, New Jersey 08807-0500
Phone 908.683.5433
Fax 908.707.3706